

FIG. 1A  
(Prior Art)

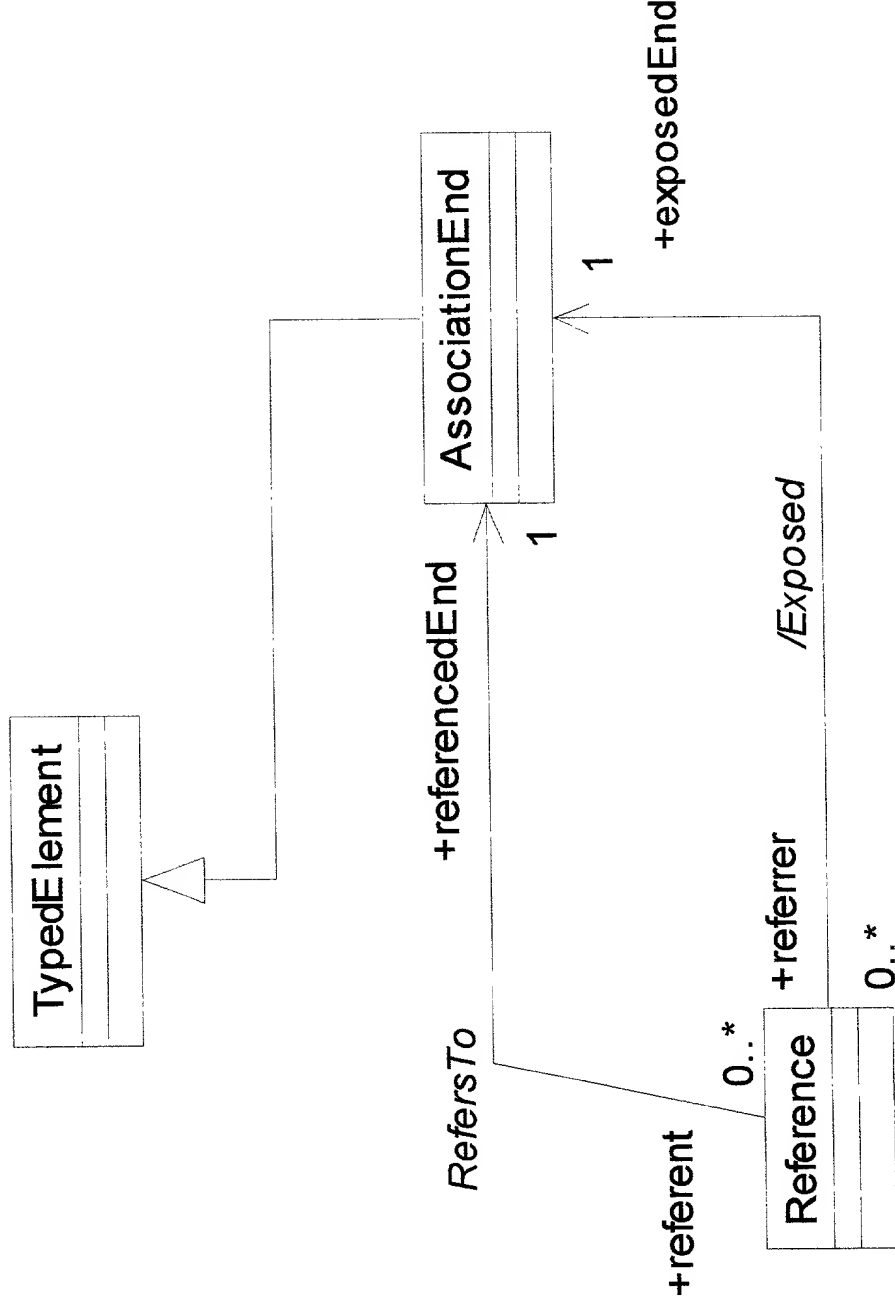


FIG. 1B  
(Prior Art)

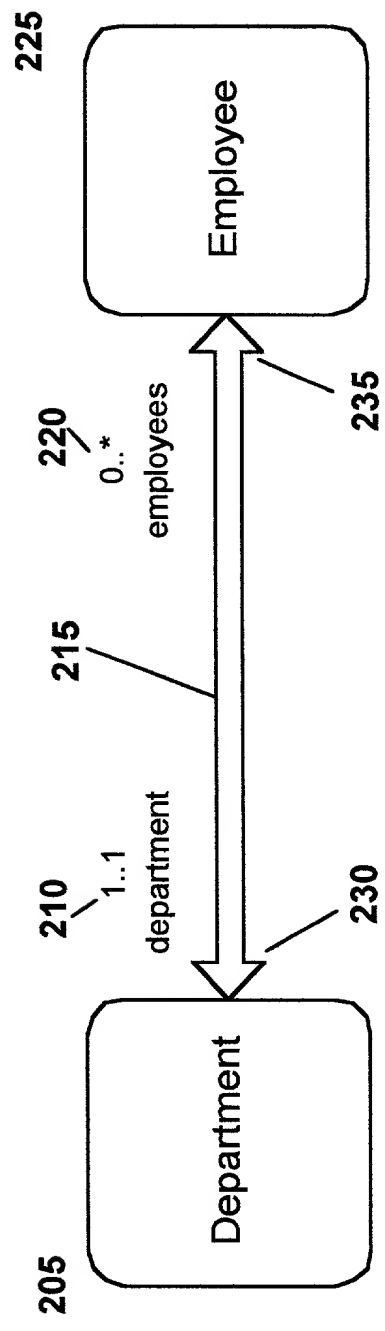
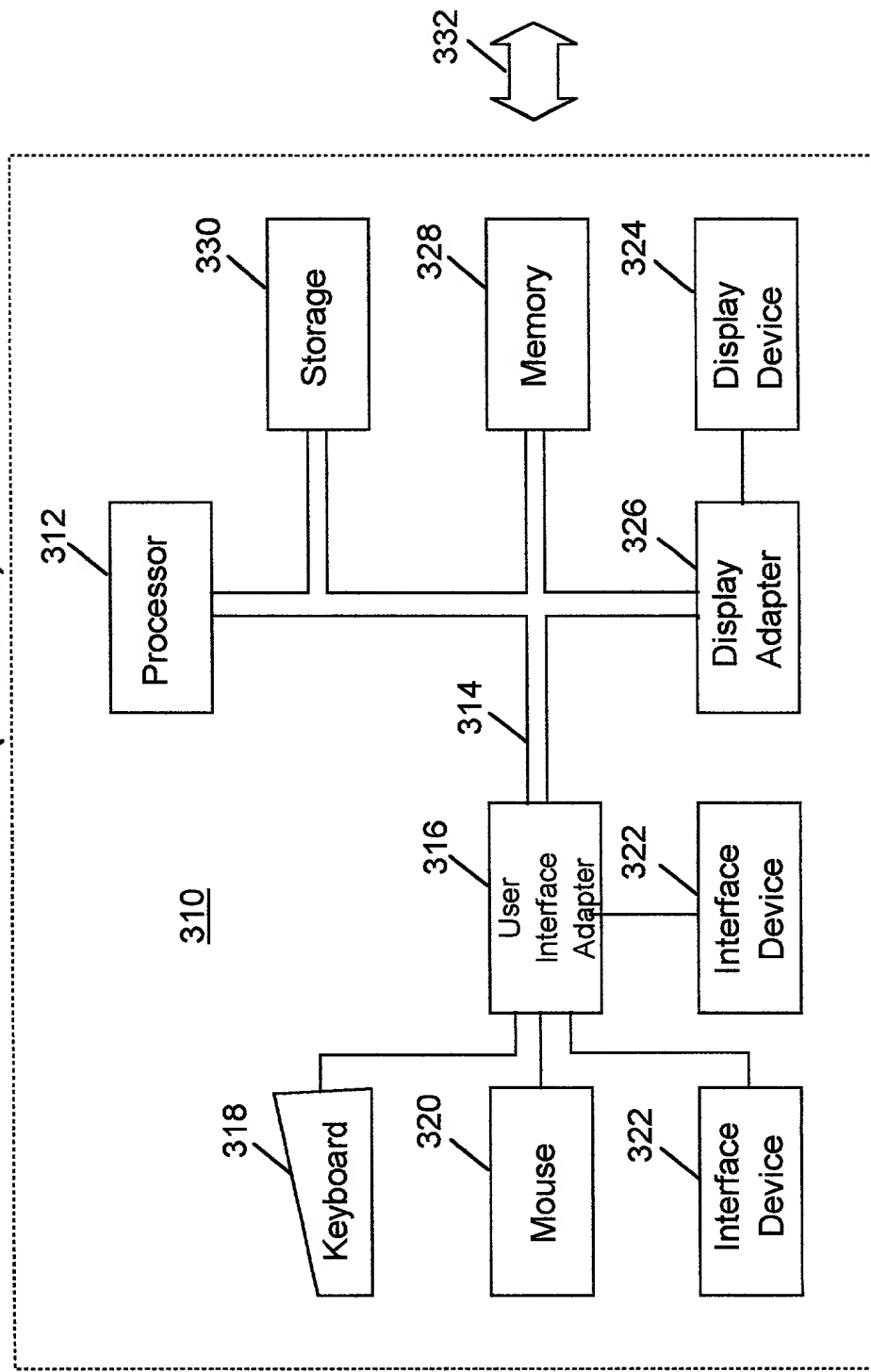


FIG. 2

FIG. 3 (Prior Art)



**FIG. 4**  
**(Prior Art)**

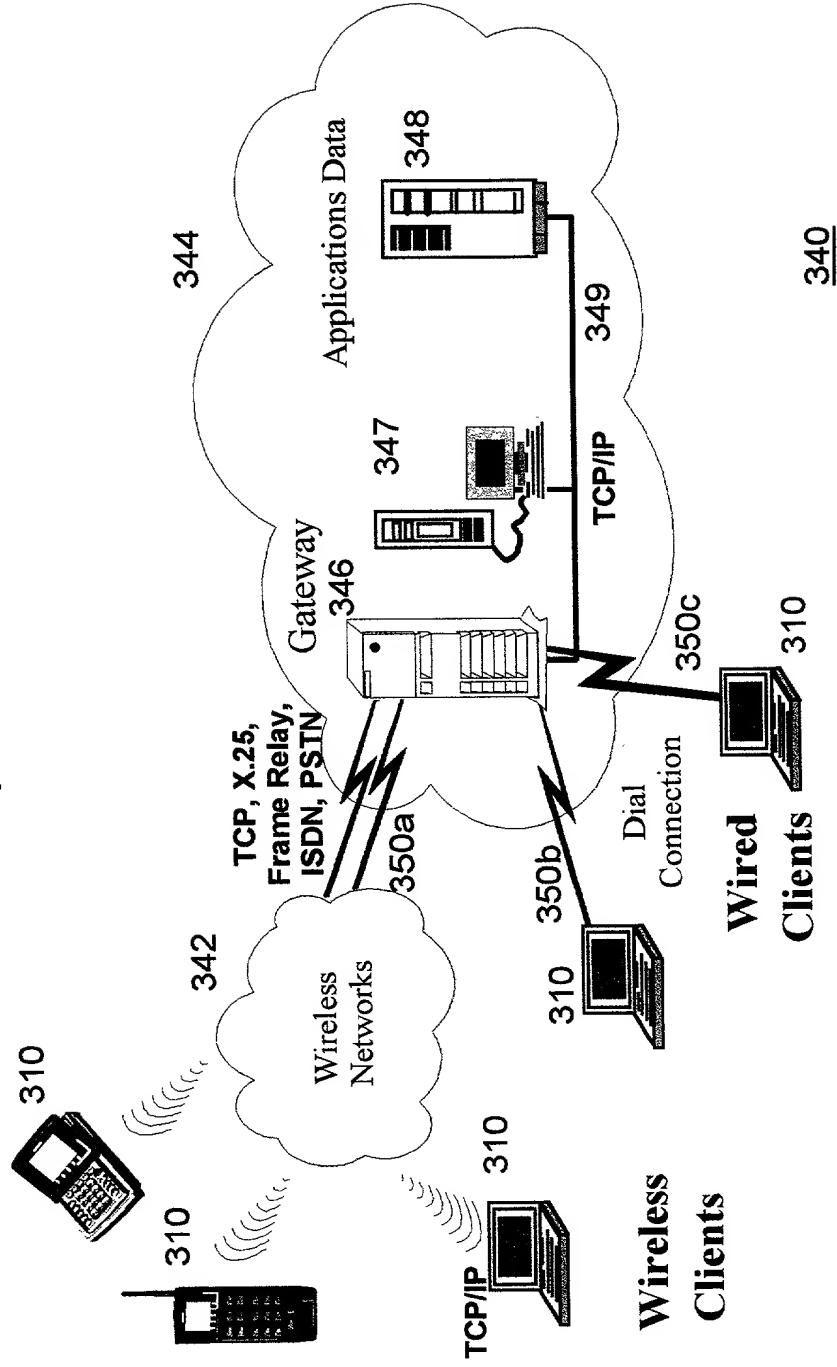


FIG. 5

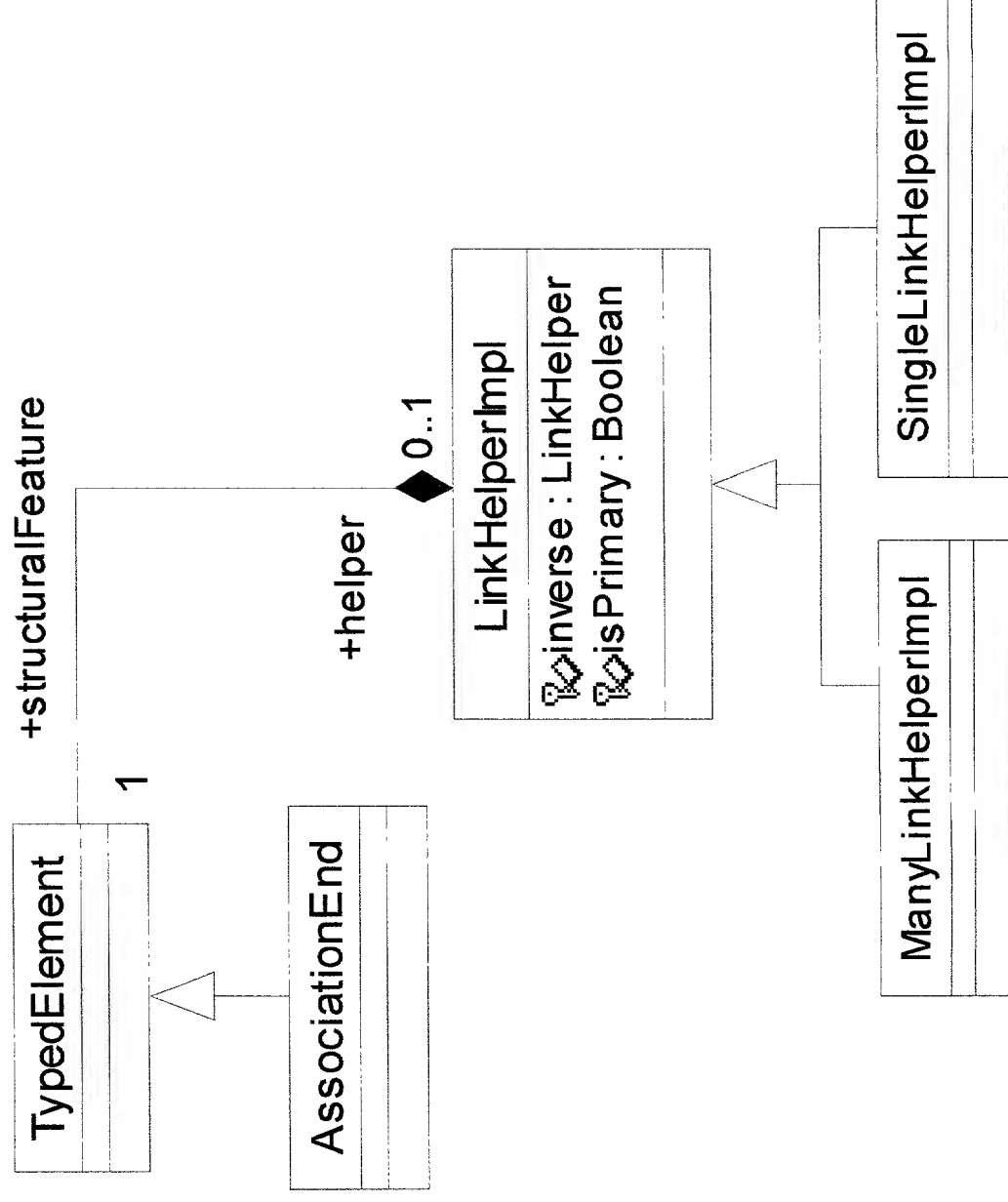


FIG. 6

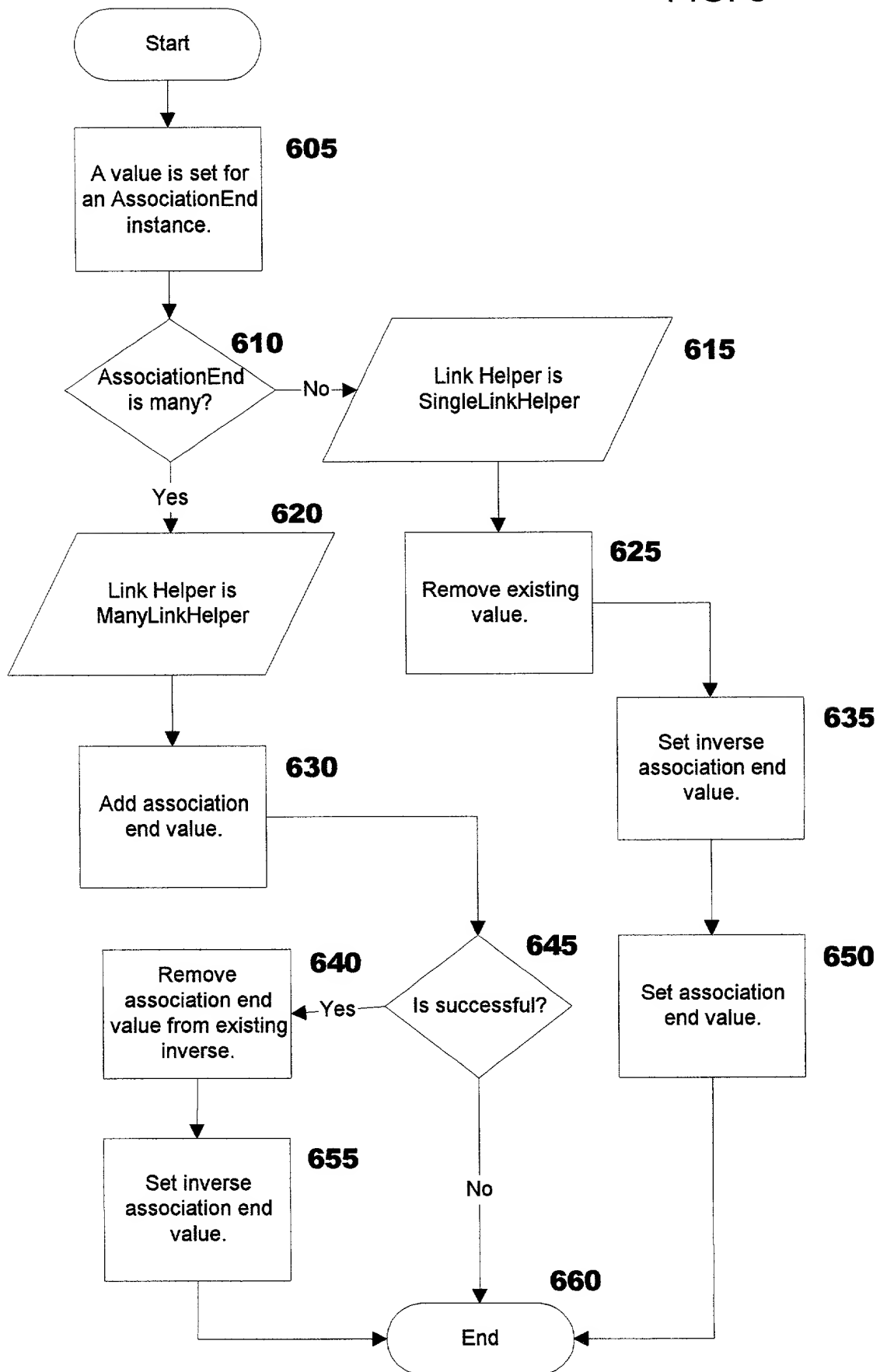


FIG. 7

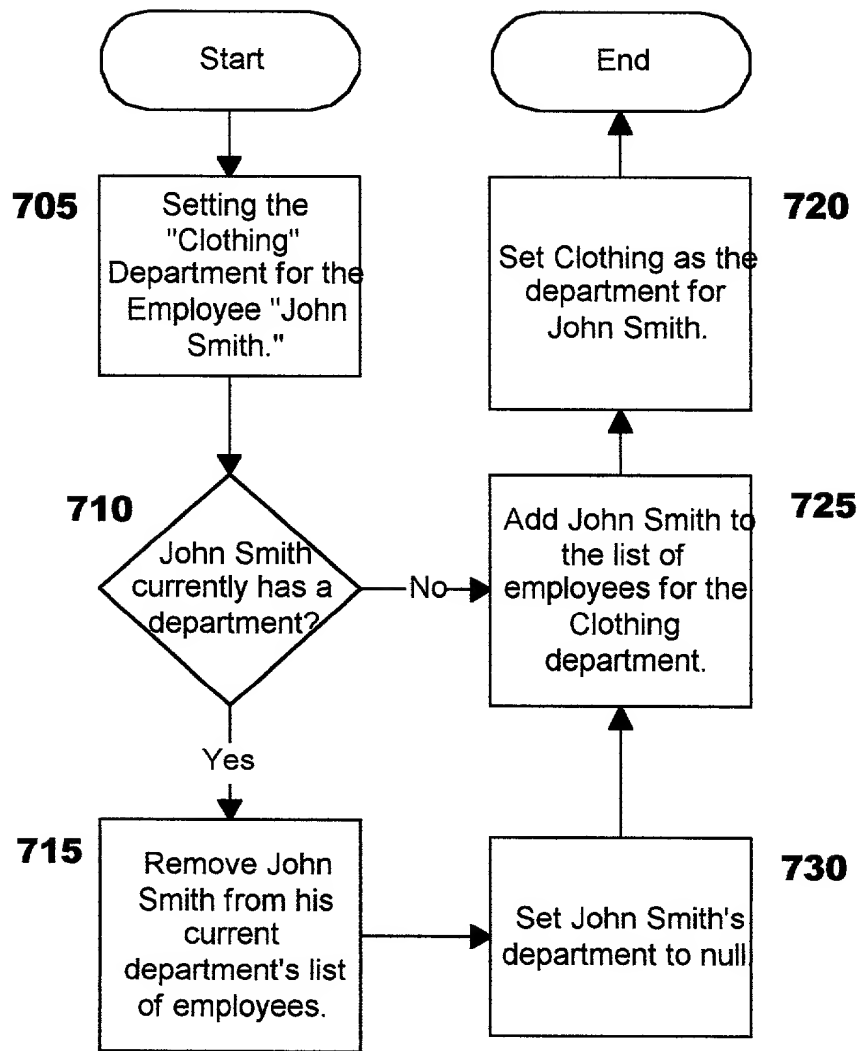


FIG. 8

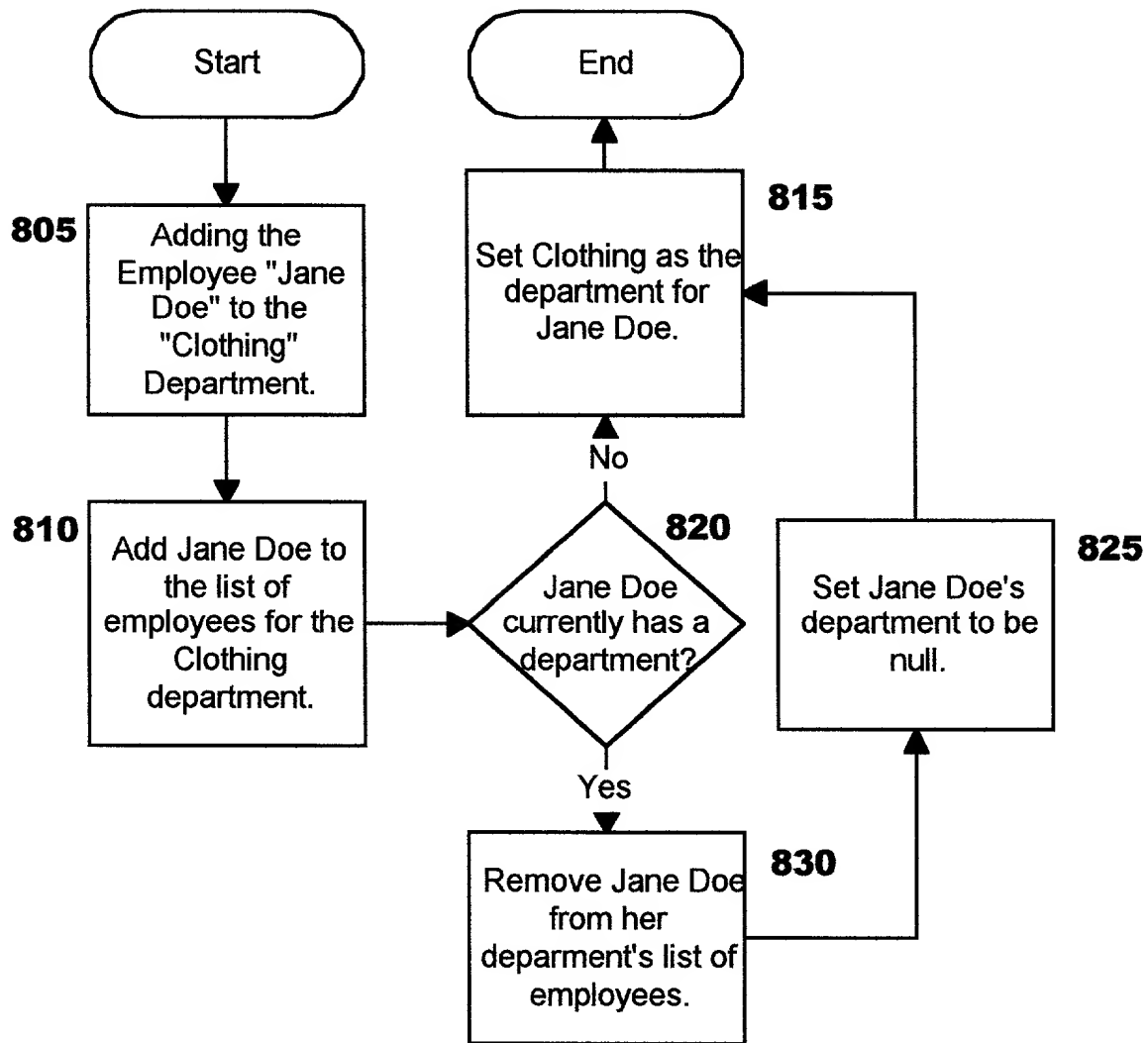




FIG. 9A

```
<?xml version="1.0" encoding="UTF-8"?>
<XML xmi.version="1.1" timestamp="Mon Sept 20 16:13:08 EST 2000" xmlns:mof="schemas/MOF.xmi">
  <XML.header>
    <XML.model xmi.name="Company"/>
    <XML.metamodel xmi.name="mof" xmi.version="1.0" href="schemas/MOF.xmi"/>
  </XML.header>
  <XML.content>
    <mof:Package xmi.id="Company" name="Company">
      <mof:Namespace.contents>
        <mof:Class xmi.id="Department" name="Department">
          <mof:Namespace.contents>
            <mof:Attribute xmi.id="Department_name" multiplicity="1..1" name="name">
              <mof:TypedElement.type>
                <mof:DataType href="schemas/mof.xmi#String"/>
              </mof:TypedElement.type>
            </mof:Attribute>
          </mof:Namespace.contents>
        </mof:Class>
        <mof:Class xmi.id="Employee" name="Employee">
          <mof:Namespace.contents>
            <mof:Attribute xmi.id="Employee_lastName" multiplicity="1..1" name="lastName">
              <mof:TypedElement.type>
                <mof:DataType href="schemas/mof.xmi#String"/>
              </mof:TypedElement.type>
            </mof:Attribute>
            <mof:Attribute xmi.id="Employee_firstName" multiplicity="1..1" name="firstName">
              <mof:TypedElement.type>
                <mof:DataType href="schemas/mof.xmi#String"/>
              </mof:TypedElement.type>
            </mof:Attribute>
          </mof:Namespace.contents>
        </mof:Class>
      </mof:Namespace.contents>
    </mof:Package>
  </XML.content>
</XML>
```

|         |
|---------|
| FIG. 9A |
| FIG. 9B |

FIG. 9

FIG. 9B

```

<mof:Attribute xmi.id="Employee_title" multiplicity="1..1" name="title">
<mof:TypedElement.type>
  <mof:DataType href="schemas/mof.xmi#String"/>
</mof:TypedElement.type>
</mof:Attribute>
</mof:Namespace.contents>
</mof:Class>
<mof:Association xmi.id="DepartmentToEmployees" name="DepartmentToEmployees">
<mof:Association.associationEnds>
  <mof:AssociationEnd xmi.id="DepartmentToEmployees_employees" multiplicity="0..*"
    name="employees" aggregation="COMPOSITE" type="Employee"/>
  <mof:AssociationEnd xmi.id="DepartmentToEmployees_department" multiplicity="1..1"
    name="department" aggregation="NONE" type="Department"/>
</mof:Association.associationEnds>
</mof:Association>
</mof:Namespace.contents>
</mof:Package>
</XMI.content>
</XMI>

```

910 920 930

FIG. 10

**1000**

```
<?xml version="1.0" encoding="UTF-8"?>
<XML xmi.version="1.1" timestamp="Mon Oct 20 16:16:25 EST 2000"
      xmlns:mof="schemas/MOF.xmi" xmlns:Company="schemas/company.xmi">
  <XML.header>
    <XML.model xmi.name="Employees"/>
    <XML.metamodel xmi.name="mof" xmi.version="1.0" href="schemas/MOF.xmi"/>
    <XML.metamodel xmi.name="Company" xmi.version="1.0" href="schemas/company.xmi"/>
  </XML.header>
  <XML.content>
    <Company:Employee xmi.id="E003" firstName="John" lastName="Smith" title="Staff"/>
    <Company:Employee xmi.id="E005" firstName="Jane" lastName="Doe" title="Staff"/>
  </XML.content>
</XML>
```

1010

1020

FIG. 11

**1100**

```
<?xml version="1.0" encoding="UTF-8"?>
<XML xmi.version="1.1" timestamp="Mon Oct 20 16:16:25 EST 2000"
      xmlns:mof="schemas/MOF.xmi" xmlns:Company="schemas/company.xmi" xmlns:Employees="employees.xmi">
  <XML.header>
    <XML.model xmi.name="Figure 7 Before"/>
    <XML.metamodel xmi.name="mof" xmi.version="1.0" href="schemas/MOF.xmi"/>
    <XML.metamodel xmi.name="Company" xmi.version="1.0" href="schemas/company.xmi"/>
  </XML.header>
  <XML.content>
    <Company:Department xmi.id="Clothing" name="Clothing"/> 1110
    <Company:Department xmi.id="Shoes" name="Shoes">
      <Company:Department.employees>
        <Company:Employee href="employees.xmi#E003"/> 1120
        </Company:Department.employees> 1130
      </Company:Department>
    </XML.content>
  </XML>
```

**1200**

```
<?xml version="1.0" encoding="UTF-8"?>
<XML xmi.version="1.1" timestamp="Mon Oct 20 16:16:25 EST 2000"
      xmlns:mof="schemas/MOF.xmi" xmlns:Company="schemas/company.xmi"
      xmlns:Employees="employees.xmi">
  <XML.header>
    <XML.model xmi.name="Figure 7 After"/>
    <XML.metamodel xmi.name="mof" xmi.version="1.0" href="schemas/MOF.xmi"/>
    <XML.metamodel xmi.name="Company" xmi.version="1.0" href="schemas/company.xmi"/>
  </XML.header>
  <XML.content>
    <Company:Department xmi.id="Clothing" name="Clothing">
      <Company:Department.employees>
        <Company:Employee href="employees.xmi#E003"/>
      </Company:Department.employees>
    </Company:Department>
    <Company:Department xmi.id="Shoes" name="Shoes"/>
  </XML.content>
</XML>
```

**1210**

**1220**

FIG. 13

**1300**

```
<?xml version="1.0" encoding="UTF-8"?>
<XML xmi.version="1.1" timestamp="Mon Oct 20 16:16:25 EST 2000"
  xmlns:mof="schemas/MOF.xmi" xmlns:Company="schemas/company.xmi" xmlns:Employees="employees.xmi">
  <XML.header>
    <XML.model xmi.name="Figure 8 Before"/>
    <XML.metamodel xmi.name="mof" xmi.version="1.0" href="schemas/MOF.xmi"/>
    <XML.metamodel xmi.name="Company" xmi.version="1.0" href="schemas/company.xmi"/>
  </XML.header>
  <XML.content>
    <Company:Department xmi.id="Clothing" name="Clothing">
      <Company:Department.employees>
        <Company:Employee href="employees.xmi#E003"/> 1310
      </Company:Department.employees>
    </Company:Department>
    <Company:Department xmi.id="Shoes" name="Shoes">
      <Company:Department.employees>
        <Company:Employee href="employees.xmi#E005"/> 1320
      </Company:Department.employees>
    </Company:Department>
  </XML.content>
</XML>
```

FIG. 14

**1400**

```
<?xml version="1.0" encoding="UTF-8"?>
<XML xmi.version="1.1" timestamp="Mon Oct 20 16:16:25 EST 2000"
    xmlns:mof="schemas/MOF.xmi" xmlns:Company="schemas/company.xmi" xmlns:Employees=employees.xmi>
  <XML.header>
    <XML.model xmi.name="Figure 8 After"/>
    <XML.metamodel xmi.name="mof" xmi.version="1.0" href="schemas/MOF.xmi"/>
    <XML.metamodel xmi.name="Company" xmi.version="1.0" href="schemas/company.xmi"/>
  </XML.header>
  <XML.content>
    <Company:Department xmi.id="Clothing" name="Clothing">
      <Company:Department.employees>
        <Company:Employee href="employees.xmi#E003"/> 1410
        <Company:Employee href="employees.xmi#E005"/> 1420
      </Company:Department.employees>
    </Company:Department>
    <Company:Department xmi.id="Shoes" name="Shoes"/> 1430
  </XML.content>
</XML>
```

FIG. 15

1. If the end is a composite aggregation (aggregation by value), it is the primary end.  
else
2. If an inverse exists and the inverse is a composite aggregation, then it is not the primary end.  
else
3. If the end is a shared aggregation (aggregation by reference), it is the primary end.  
else
4. If an inverse exists and the inverse is a shared aggregation, then it is not the primary end.  
else
5. If the end is navigable,
  - 5a. If an inverse exists and the inverse is navigable,
    - 5a1. If the inverse is already the primary end, then this end is not the primary end.  
else
    - 5a2. If the end's multiplicity is many (upper bound is greater than 1), then it is the primary end.
  - else
  - 5b. This end is the primary end.